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IS/ISO 9962-2 (1992): Manually Operated Drafting Machines, Part 2: Characteristics, Performance, Inspection and Marking [PGD 22: Educational Instruments and Equipment]

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भाग 2 लाक्षनिक कार्यकारिता, निरीक्षण और विषणन

Indian Standard

MANUALLY OPERATED DRAUGHTING MACHINES

PART 2 CHARACTERISTICS, PERFORMANCE, INSPECTION AND MARKING

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Optical and Mathematical Instruments Sectional Committee, LM 20

NATIONAL FOREWORD

This Indian Standard which is identical with ISO 9962-2 : 1992 'Manually operated draughting machines — Part 2 Characteristics, performance inspection and marking', issued by International Organization for Standardization (ISO), was adopted by the Bureau of Indian Standards on the recommendation of the Optical and Mathematical Instruments Sectional Committee (LM 20) and approval of Light Mechanical Engineering Division Council.

The standard is being published in following three parts:

Part 1 Definitions, classification and designation;

Part 2 Characteristics, performance, inspection and marking; and

Part 3 Dimensions of scale rule chuck plates (under preparation).

The requirements of draughting machine were earlier covered in IS 2287 : 1970 'Specification for drafting machines (*first revision*)' which will be withdrawn after publication of all three parts. IS 2287 : 1970 was also covering the certification of draughting machines which will now be covered by part 2 of IS/ISO 9962-2 : 1992.

The text of ISO Standard has been approved as suitable for publication as Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker while in Indian Standards the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 9962-1 : 1992	IS/ISO 9962-1 : 1992 Manually operated draughting machines : Part 1 Definitions, classification and designation	Identical
ISO 9962-3 : 1994	IS/ISO 9962-3 : 1994 Manually operated draughting machines : Part 3 Dimensions of scale rule chuck plates (under preparation)	Identical

In the text of ISO 9962-2, it is mentioned that ISO 9962-3 is to be published. The standard has now been published as ISO 9962- 3 : 1994 as indicated above.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expresssing the result of a test of analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

The product may also be marked with the Standard Mark.

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Indian Standard

MANUALLY OPERATED DRAUGHTING MACHINES

PART 2 CHARACTERISTICS, PERFORMANCE, INSPECTION AND MARKING

1 Scope

This part of ISO 9962 specifies the appearance and construction, performance, inspection and marking of manually operated draughting machines.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 9962. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 9962 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 9962-1:1992, *Manually operated draughting machines — Part 1: Definitions, classification and designation.*

ISO 9962-3:—[1], *Manually operated draughting machines — Part 3: Dimensions of scale rule chuck plates.*

3 Definitions

For the purposes of this part of ISO 9962, the definitions given in ISO 9962-1 apply.

4 Requirements

4.1 Appearance and construction

The appearance and construction of manually operated draughting machines shall comply with the characteristics given in 4.1.1 to 4.1.15.

4.1.1 All parts shall be made of sufficiently strong and rigid materials and shall be manufactured and assembled with care.

4.1.2 Coating or surface treatment of the various parts shall be carried out with care in order to prevent changes in colour, peeling or rusting.

4.1.3 Graduation lines on the protractor and vernier shall be clear and of even width and shall be free of curves, defacing, inking errors, etc.

4.1.4 Numbers and other indications on the protractor and the vernier shall be clear and free of omissions, errors, defacing, inking errors, etc.

4.1.5 The fixing bracket shall allow the manually operated draughting machine to be attached firmly.

4.1.6 The contact adjusting screw, if provided, shall operate smoothly and with ease.

4.1.7 The dimensions of the grooves on the scale rule mounting plate shall allow assembly with scale rule chuck plates in accordance with ISO 9962-3.

4.1.8 It shall be possible to attach scale rules to the scale rule mounting plate and to fix them securely with ease.

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[1] To be published.

4.1.9 The scale rule mounting plate shall rotate smoothly.

4.1.10 The reference line lever shall operate smoothly and locking shall be secure.

4.1.11 The indexing lever shall operate smoothly and the positioning by means of the indexing plate shall be secure.

4.1.12 The angle lever shall operate smoothly and locking shall be secure.

4.1.13 The mechanism shall operate smoothly, and without play and abnormal noise.

4.1.14 In vertical plane use, the head shall remain stationary at any position on the drawing board.

4.1.15 Horizontal and vertical brakes shall operate smoothly and locking shall be secure.

4.2 Performance

The performance of manually operated draughting machines shall satisfy the requirements given in table 1.

Table 1 — Performance requirements

No.	Performance	Items to be measured	Measuring method	Measuring instruments	Permissible value or deviation
4.2.1	Accuracy of protractor and vernier graduations	Coincidence of protractor and vernier graduations	Make the zero point of the vernier coincide with an arbitrary graduation on the protractor, and measure the difference between the maximum graduation on the vernier (excluding any auxiliary graduation) and the maximum graduation on the protractor. Carry out this measurement within ± 90° of the normal horizontal position, and take the maximum value among the measurements as the measured value. Where the reference line is adjustable and is equipped with a vernier, the same measurements shall be carried out.	Magnifier with magnification of not less than × 5	Minimum reading of the vernier: 10′ or 5′

No.	Performance	Items to be measured	Measuring method	Measuring instruments	Permissible value or deviation
4.2.2	Accuracy of attachment of protractor and indexing plate	Coincidence of vernier and protractor graduations when index is used	Measure the difference between the indicated graduation on the protractor and the zero point of the vernier scale when the scale rule mounting plate is positioned at each index of the indexing plate by using the indexing lever. Take the maximum value of the measurements as the measured value.	Magnifier with magnification of not less than × 5	Minimum reading of the vernier: 10′ or 5′
4.2.3	Deviation of protractor graduations and eccentricity of protractor	Deviation between the protractor graduations and standard angle lines	Mount the manually operated draughting machine on an inspection drawing board and attach a horizontal inspection scale rule. Release the indexing plate, loosen the angle lever, and make the zero point of the vernier coincide with the zero point of the protractor to position the index. Loosen the reference line lever, and make the horizontal scale rule coincide with a horizontal standard line. Lock the reference line lever. Release the indexing plate again and make the scale rule coincide with an arbitrary standard angle line to measure the deviation of the protractor graduation. Carry out these measurements at intervals of 15° within ± 90° of the normal horizontal position of the inspection scale rule. Take the maximum value of the measurements as the measured value.	Inspection drawing board, inspection scale rule, and magnifier with magnification of not less than × 5	Minimum reading of the vernier: 10′ or 5′

No.	Performance	Items to be measured	Measuring method	Measuring instruments	Permissible value or deviation
4.2.4	Accuracy of indexing plate divisions	Deviation between the scale rule positioned by the indexing plate and standard angle lines	Position the indexing plate at the zero point of the protractor, make the horizontal inspection scale rule coincide with a horizontal standard line and lock it by using the reference line lever or fine adjuster. Place the head at the centre of the standard angle lines, position the scale rule mounting plate on the arbitrary indexing plate at intervals of 15° within ± 90° of the normal horizontal position of the inspection scale rule, make the standard angle line of the angle coincide with the scale rule, and measure the deviation between them each time at the end point of the scale rule graduation lines. Take the maximum value of the measurements as the measured value.	Inspection drawing board, inspection scale rule and magnifier with magnification of not less than × 5	± 0,3 mm at the end point of the scale rule graduation lines In addition, when the scale rule is returned to the zero point after the measurement, it shall accurately return to the original position
4.2.5	Accuracy of parallel movement of scale rule	Deviation between the horizontal scale rule and the horizontal standard lines within the usable area (see ISO 9962-1:1992, table 3)	Place the inspection scale rule horizontally to coincide with a horizontal standard line, move the head to make it coincide with each horizontal standard line on the inspection drawing board. Measure the deviations each time between the end point of the scale rule graduation lines and the standard line. Take the maximum value of the measurements as the measured value.	Inspection drawing board, inspection scale rule and magnifier with magnification of not less than × 5	± 0,3 mm at the end point of the scale rule graduation lines

No.	Performance	Items to be measured	Measuring method	Measuring instruments	Permissible value or deviation
4.2.6	Accuracy of perpendicularity of track-type draughting machine	Deviation of the parallelism between the horizontal track and a horizontal standard line, also taking into account the straightness of the horizontal track Deviation of the parallelism between the vertical track and vertical standard lines, also taking into account the straightness of the vertical track	Place the horizontal rail in a position parallel to a horizontal standard line. Make the inspection scale rule coincide horizontally with a horizontal standard line. Transfer the head to the upper part of the inspection drawing board and make the division line of the zero (0) position on the inspection scale rule coincide with one of the vertical standard lines and lock the horizontal brake lever. Transfer the head along the vertical track within the usable area and measure the deviations between the division line of the zero position and the vertical standard line. Repeat for the other vertical standard lines (see figure A.1). Rotate the inspection scale rule by 90° in the vertical direction and repeat for the other horizontal standard lines (see figure A.1). Take the maximum value of the measurements as the measured value.	Inspection drawing board, inspection scale rule and magnifier with magnification of not less than × 5	± 0,3 mm on the maximum value

No.	Performance	Items to be measured	Measuring method	Measuring instruments	Permissible value or deviation
4.2.7	Scale rule contact	Clearance between the scale rules and drawing board	Place the inspection horizontal and vertical scale rules in the scale rule mounting plate. Bring the scale rules into contact with the inspection drawing board, move the head within the usable area (see ISO 9962-1:1992, table 3) and measure the clearance between the scale rules and the drawing board. Take the maximum value of the measurements as the measured value.	Inspection drawing board, inspection scale rules and clearance feeler gauges	0,3 mm max.

NOTES

1 The inspection drawing board shall be used for track-type and link-type draughting machines with the counterweight at 75° to the horizontal.

The inspection drawing board shall be used horizontally for link-type draughting machines without counterweight (only for horizontal plane use).

2 The inspection scale rule and the inspection drawing board shall be as specified in annex A.

5 Inspection

An inspection of the appearance, construction and performance of manually operated draughting machines shall be made and the requirements of 4.1 and 4.2 shall be met.

The inspection scale rule and the standard inspection drawing board to be used for inspection of manually operated draughting machines shall be in accordance with annex A.

6 Marking

Manually operated draughting machines shall be marked with the following items in a conspicuous place:

a) the manufacturer's name or registered trade mark;

b) the designation, in accordance with ISO 9962-1;

c) the year and month of manufacture.

Annex A
(normative)

Requirements for the scale rule and inspection drawing board used for inspection

A.1 Inspection scale rule

The inspection scale rule shall be of type 300 L or 300 S, with a straightness tolerance of 50 μm or less.

Its weight shall correspond to the weight of the scale rule provided for the manually operated draughting machine.

A.2 Standard inspection drawing board

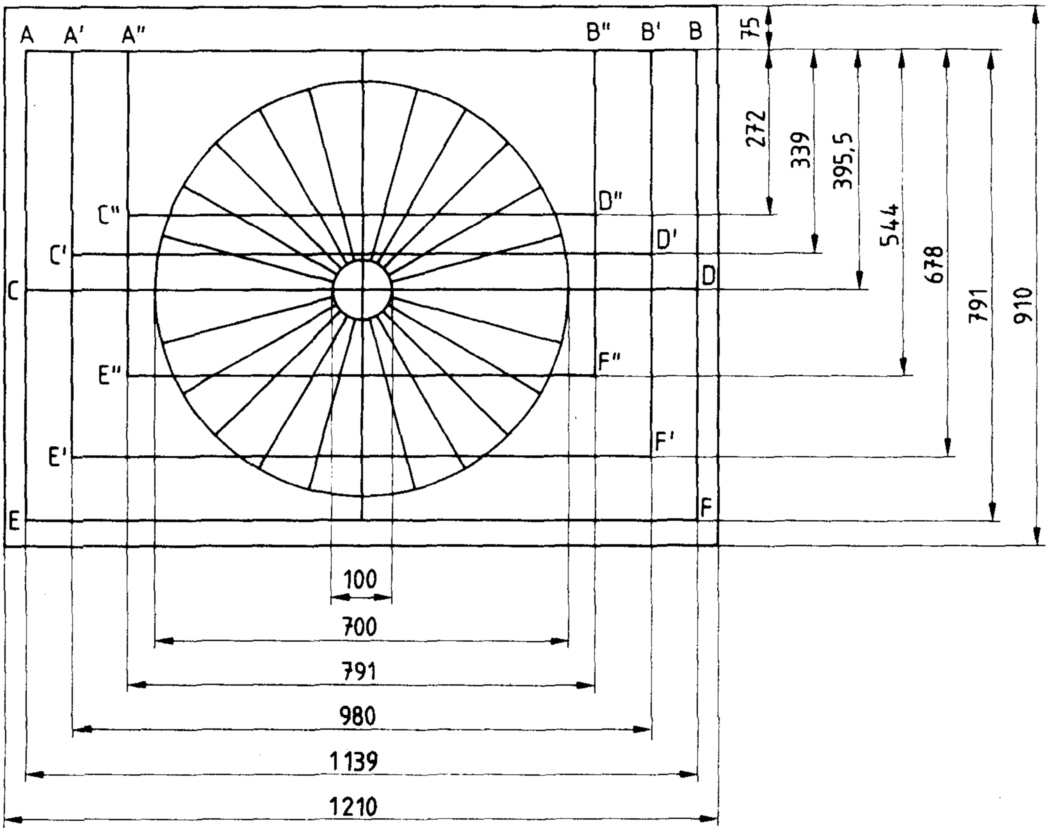
The standard inspection drawing board shall comply with the requirements specified in table A.1. (The missing data are under consideration and will be specified in a separate standard.)

The standard lines engraved on the board should be as illustrated in figure A.1. However, any inspection drawing board which meets the requirements specified in table A.1 and is capable of measuring the performance of manually operated draughting machines may be used, without necessarily complying with figure A.1.

Table A.1 — Requirements for inspection drawing board

Lines engraved on the upper surface of the inspection drawing board (see figure A.1)	Width	⩽ 0,25 mm for horizontal lines ⩽ 0,35 mm for other lines
	Parallelism tolerance	⩽ 0,15 mm per 1 000 mm
	Straightness tolerance	⩽ 0,15 mm per 1 000 mm
	Angular tolerance	1,5′
Flatness tolerance of inspection drawing board		⩽ 0,3 mm per 1 000 mm (concavity)

Dimensions in millimetres



NOTES

1 The letters indicate the horizontal standard lines to be used for the measurement of the accuracy of parallelism by moving the inspection scale rule as specified in 4.2.5 and shall be as follows:

- for manually operated draughting machines designated 0912, use lines AB, CD and EF;
- for manually operated draughting machines designated 0609, use lines A"B", C"D"and E"F".

2 To measure the vertical parallelism of track-type draughting machines as specified in 4.2.6, use line BF and the vertical centre-line for 0912 type. For 0609 type, use line B"F" and the vertical centre-line. To measure the horizontal parallelism of track-type draughting machines as specified in 4.2.6, use line EF and the horizontal centre-line CD for 0912 type. For 0609 type, use line E"F" and the horizontal centre-line CD.

Figure A.1 — Lines engraved on the upper surface of the inspection drawing board

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